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ABSTRACT

In winter of 1993, a design research project was conducted in the Department of Interior Design at Ohio State University by interdisciplinary teams of graduate students from Industrial Design, Industrial Systems and Engineering, Marketing, and Communication. It was, in effect, a course which aimed to apply knowledge from the students' diverse backgrounds to developing future applications in interactive video. This paper chronicles the development and execution of the course, including the ways in which members convened and communicated, team formation, activities of the four project groups, and evaluation methods. A course reading list is appended. (BEW)

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ED 393 421

AN INTERDISCIPLINARY APPROACH TO CONCEPT DEVELOPMENT FOR INTERACTIVE VIDEO COMMUNICATION SYSTEMS

by
Susan King Roth

New technologies are changing the way we communicate, learn, and teach. In Winter of 1993 a design research project was conducted in the Department of Industrial Design at The Ohio State University by interdisciplinary teams of graduate students from Industrial Design, Industrial Systems and Engineering, Marketing, and Communication. The objective of the course was to allow students with diverse backgrounds to apply knowledge from their respective areas to the development of concepts through team methods. The project, sponsored by Thomson Consumer Electronics and Indiana Bell, involved the development of future applications for interactive video communication systems. This area of research is enormously active at the present time with telephone and cable companies, electronics firms, film and television production companies, computer hardware and software companies, and others, trying to assure that they will not be left out of what promises to the be the next great wave of economic and technological development.

The original intent of the course was to focus on human factors in the design process. Because of the scope of the project and the exploratory interests of the sponsors, however, a longer time than expected was spent in the discovery phase (searching for useful and relevant application areas) than in the design phase. Extensive readings were assigned to students (and instructors) in order that participants from all disciplines *get up to speed* with the latest information on electronic communication technologies.

Emphasis was placed throughout the course on the importance of working in interdisciplinary teams. Team members evaluated each other at midterm and at the conclusion of the course and this information contributed to each student's final grade.

There was extensive communication with the sponsoring organizations in Indiana. Three videoconferences and two face-to-face meetings took place over a ten-week quarter. The sponsors freely gave the student teams information and feedback, but very little direction. Their purpose was exploratory.

The course was taught by co-instructors Susan King Roth, Assistant Professor of Visual Communication Design in the Department of Industrial Design at OSU, and Dr. Elizabeth B.N. Sanders, Vice President for Research and Strategies at Fitch, Inc., an international design firm.

Guest lecturers were invited from other departments to complement the background of the instructors. These guests included Dr. Steven Acker from the Department of Communication, and Dr. Dave Woods from Cognitive Engineering discussed human factors research methods. John McClusky from the Department of Industrial and Systems Engineering discussed team formation.

Course Structure

The course was structured around periodic scheduled meetings with the sponsors in the form of face-to-face meetings, videoconferencing sessions, and e-mail communications via computer. The instructors developed a calendar at the beginning of the quarter that included key meeting points and other events as they should occur in sequence to assist the

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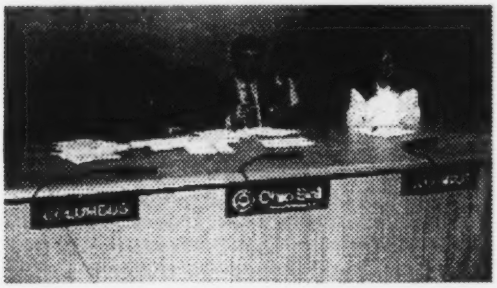
problem-solving process.

We were fortunate to have extensive access to videoconferencing facilities at Ohio Bell headquarters in Columbus (through arrangement with Indiana Bell), so that we were able to use the same live, interactive video technology that was also the subject of the course, thereby becoming aware of the advantages and disadvantages of communicating and collaborating in this way.



Students located at the Ohio Bell videoconference facility seated before the camera and television monitor unit that transmitted and received communications from Indiana and Columbus. A second camera overhead transmitted graphics.

Team Formation

Nineteen graduate students from four different academic departments participated in the class. Students were solicited from Business (MBA/Technology Management) Communication, Industrial and Systems Engineering, and Industrial Design. All of the class meetings, videoconferences, and presentations were videotaped by a Communication student. Another student from Communication provided a meta-analysis of the course, working teams, and group dynamics incorporating information related to collaborative research projects into her thesis study. All students were pursuing graduate degrees in their respective departments; many were mature with previous professional experience, and the represented various cultures and ethnic backgrounds.

The first step in team formation required that the students share information about themselves by filling out a short questionnaire. This information was used to form three preliminary research teams balanced in terms of department, age, sex, and country of origin.

Each of the teams selected a content area in which to conduct research for the first four weeks of the quarter.

The goal of the research teams was to gain an in-depth understanding of the preliminary area of focus (either society, technology, or individual/group) and to explore opportunities for future applications of interactive video technologies. At midterm, the research teams presented their understanding of the problem space and ideas for applications as well as desirable attributes for the communication systems.

New teams were formed after the midterm presentation. Four concept or design teams were formed by balancing discipline and research focus. Minor adjustments were made due to personality factors that emerged in the first set of teams.

Project Groups

The assignment of projects to the four design teams was a highly collaborative process. Selection of the project areas was done in a face-to-face work session following the midterm presentation. Present at the work session were students, instructors, sponsors, and several outside guests with an interest in the subject.

Research team members were responsible for submitting index cards describing potential applications that emerged during the course of their preliminary studies and discussions. Over 70 ideas were offered as a result of brainstorming. Closely related ideas were placed in the same category, resulting in 16 separate categories. With guidance from the sponsors, four very distinct

project areas were chosen. These four areas were:

1. Remote Troubleshooting/ Diagnostics (on the scene access to experts).

2. VolksVision (personal applications of video and electronic technology).

3. Education (K-12, higher education, continuing education).

4. Town Hall (political and social group interaction).

Assignment of projects to design teams took place the following week. We assigned project areas randomly by drawing student names when some of the project areas proved more *popular* than others. This resulted in an equal distribution of students to all areas.

Each team was responsible for developing concepts in the project area assigned and presenting results in the form of a preliminary and final presentation to the sponsors and the class. Each was to produce a written document as well.

Evaluation

Students were evaluated on the results of their teamwork (60% of the grade) as well as their performance as team members (40%). Results of their teamwork were shown in a preliminary presentation via videoconference facilities and in the final presentation (a face-to-face meeting). The final presentation used a variety of media such as slides, video, and computer-generated interface designs to demonstrate proposed applications. Written reports included:

- a problem statement
- technological underpinnings
- market analysis and planning
- user research
- product/service embodiments
- recommendations to Thomson-Indiana Bell.

Cards representing 70 ideas generated during a brainstorming session were placed on the wall in order to establish categories of ideas on a Concept Location Matrix. A separate *attributes* section describing desirable attributes was also created, with cards copied and distributed to each of the four concept groups. Combining ideas with attributes resulted in further concept generation and definition.

Participants from the Department of Communication played a significant role in the evaluation of existing applications, with one of the highlights of the course being the lecture by Dr. Steven Acker on eye contact and the effect of image size and other factors on acceptance of videocommunication as a reasonable substitute for face-to-face communication. Communication students brought a knowledge of media and public policy to the teams.

Students presented extensive research reports during the final presentation, with Business students supplying the marketing plan, while Design students produced visualizations (concept sketches and computer-based interface designs) for products and systems developed by the teams. All members of the teams supplied concepts and participated in brainstorming sessions.

Because of the experimental nature of the course, it was important that students be given a means of evaluating the course and the instruction. The form used for this purpose provided feedback that encouraged us to continue with future endeavors.

The course was extremely successful in terms of the outcome--the research

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reports were outstanding. It also provided a real-life experience with a *fuzzy* design problem (one without clearly defined parameters) and important experience working in interdisciplinary teams. There were a few negative aspects of teamwork, such as the fact that one team had fewer members due to unforeseeable circumstances and did not benefit from equal contributions by remaining team members. In the future, team dynamics will be more carefully considered and controlled. Rather than expecting a leader to *emerge* naturally, as had been predicted by students from the MBA management area, it would be preferable to assign a team coordinator or facilitator to assure progress and direction in the future.

Also, we would extend the amount of time available for this course to two quarters, or at least more than the usual ten week quarter. We hope to develop other collaborative sponsored research projects building on the strength of this experience, the wealth of *brainpower* in a variety of disciplines existing on campus, and the need to present opportunities for both graduate and undergraduate students to work on interdisciplinary teams. Additional time should ideally be devoted to testing proposed applications with user groups, and incorporating feedback into the design of new user interfaces. The most difficult aspect of predicting user reaction to new applications of technology is the inability of users to visualize or imagine how these technologies might be used. Prototypes facilitate visualization.

The key to acceptance for any new communication or information technology is attention to the human use of the system. For this reason, many of the concepts were based on needs and wants of potential users, with consideration of social and cultural factors surrounding the production and consumption of communication technologies.

In terms of project development, the design of applications for new technologies presents a challenge that involves more than one content area. It is very important to acknowledge that one person (or discipline) can not possibility know all there is to know about designing such a system or product, but must understand when to call in experts in a given area to produce the best solution.

Consistent with the project goal of developing future applications for new technologies was the finding that the use of e-mail and videoconferencing to communicate greatly enhanced management of the course. The ability to distribute timely information to students and receive their questions and comments through e-mail, and to use video conferencing to communicate with sponsors in another state facilitated progress of the course and contributed to the successful completion of the design research project.

Assigned Reading for the Course

The following reading list was supplemented by current related articles from the media and research journals:

Acker, S., & Levitt, S. (1987). Designing videoconference facilities

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for improved eye contact. *Journal of Broadcasting and Electronic Media, 31*(2), 181-191.

Bodker, S. (1991). *Through the interface. A human activity approach to user interface design.* Hillsdale, NJ: Lawrence Earlbaum Associates.

Chapter 6: User interface design: Advice to the designer, pp. 139-164.

Bretz, R. (1983). *Media for interactive communication.* London: Sage.

Part I: Some familiar interactive media systems, pp. 29-68 (television systems).

Part III: System design features: Issues and problems, pp. 167-263.

Compaine, B. (1988). *Issues in new information technology.* Cambridge, MA: Program on Information Resources Policy, Harvard University.

Chapter 1: Introduction: The information "revolution" is more than technology, pp. 1-14.

Chapter 5: Information technology and cultural change: Toward a new literacy, pp. 145-178.

Chapter 9: Contradictions and concerns, pp. 293-302.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry.* London: Sage.

Rosen, A. (1987). *Telecommunications.* San Diego: Harcourt Brace Jovanovich.

Chapter 8: Teleconferencing, pp. 183-196.

Chapter 10: The electronic home, pp. 220-241.

Schwartz, P. (1991). *The art of the long view.* New York: Doubleday-Currency.

Ulloth, D. (Ed.). (1992). *Communication technology.* Lanham, Maryland: University Press of America.

Chapter 2: Teleconferencing: A rapidly growing innovation, by L. Lappin, pp. 19-26.

Chapter 13: Interactive video: A learning tool, by R. Gould, pp. 137-144.

Chapter 14: Social effects of interactive video, by N. Greco, pp. 145-152.

Credits

This paper includes material developed by Susan King Roth, Associate Professor of Visual Communication Design, The Ohio State University, and Dr. Elizabeth Sanders, Fitch Inc., Co-instructors. A related article was published in the Winter 1994 issue of *Innovation*, journal of the Industrial Designers Association of America. The interdisciplinary project course was made possible by generous funding from Indiana Bell (Ameritech) and Thomson Consumer Electronics.

Photographs by Rich DiCenzo.